

## THE TAXONOMIC POSITION OF CERTAIN EUCALYPTS

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## Abstract

The eucalypts are recognized as belonging to two convergent genera: *Eucalyptus* s.s. and *Symphyomyrtus*. The taxonomic position of certain species is clarified. *E. lirata*, *E. microeorys*, *E. guilfoylei*, *E. raveretiana*, *E. brachyandra* and *E. deglupta* are to be included in *Symphyomyrtus*. *E. gamophylla*, *E. cloeziana*, *E. jacksoni*, *E. preissiana*, *E. megacarpa* and *E. mitrata* are to be included in *Eucalyptus* s.s. The information that *E. baileyana*, Series Eudesmieae, has stamens in 4 bundles has been overlooked. A form of *E. similis* (or a closely-related, undescribed species) which has sepals and a lobed staminophore is discussed. It is shown to support the view that the Miniatae are related to the Eudesmieae and to confirm the hypothesis of the petaline origin of the operculum in mono-operculate species. The characters of *E. cloeziana* suggest that it occupies a position intermediate between Eudesmieae and Renantherae. *E. gamophylla* is shown to be closely related to, if not identical with, *E. odontocarpa*.

## Introduction

Within the old genus *Eucalyptus* L'Hérit, it is possible to distinguish two convergent genera: *Eucalyptus* s.s. (*Eucalyptus* L'Hérit. emend. D. J. & S. G. M. Carr) and *Symphyomyrtus* Schau. emend. D. J. & S. G. M. Carr (Carr and Carr 1962a). The major characters in which the two genera differ are those of the perianth, the inflorescence, the seed coat and the arrangement of the ovules and ovulodes on the placenta (Carr and Carr 1962b). Previous authors have recognized certain smaller, more or less homogeneous and apparently natural groups of eucalypts which, subject to minor additions and deletions, can be assigned to one or other of the genera. *Eucalyptus* s.s. includes Series Eudesmieae and Miniatae, Sections Renantheroideae, Renantherae, and Renantheroideae Normales. *Symphyomyrtus* takes in Section Macrantherae (with the exclusion of Series Eudesmieae and Miniatae) and Sections Macrantherae Normales, Porantheroideae, Porantheroideae Normales, Terminales, Graciles, Micrantherae and Platyantherae of Blakely (1934, 1955). It is the purpose of this communication to clarify the taxonomic position of certain species which constitute exceptions to the general statement just made, because they were misplaced by Blakely. (As continual reference will be made to Blakely (1934, 1955) and Blake (1953) the dates will not be cited in the text.)

*Eucalyptus lirata* Maiden

The original material of this species was collected by W. V. Fitzgerald in the Kimberleys (W.A.) in 1905 (Maiden Vol. 5, p. 111; Gardner 1960) and consisted of leaves, fruits and seeds. Maiden described it and remarked that the fruits and seeds were like those of *E. similis* Maiden and that the leaves of both species were like those of *E. eudesmioides* F. Muell. Beyond this he gave no reasons for including *E. lirata* together with *E. similis* and *E. baileyana* in his Series Eudesmieae. Blakely followed the same arrangement. Maiden quoted Fitzgerald's description of the bark: 'rough and greyish, but soft and almost friable, resembling that of some forms of *E. amygdalina* Labill.', but on the next page added that 'Mr Fitzgerald says nothing of the yellowness of the bark in *E. lirata* which is obvious in *E. similis*'. The wishful

idea that the bark ought to be yellow like that of *E. similis* was taken up by Blakely in the name 'Yellow Gum' which he coined for the species, although he copied the description of the bark as 'rough and greyish'. The species was not investigated again until 1952 when Gardner collected a specimen near the summit of Mt Felix (Gardner 1960) which is near to the original locality. (We have examined Gardner 11927, 25/5/52, collected on Mt Herbert.) Gardner calls the species 'Yellow Jacket' (one of Maiden's names for *E. similis*) and says 'it has yellow fibrous bark not unlike a paperbark but of a more open texture... the bark consists of thin, flaky, easily separable layers of delicate texture interspersed with longitudinal fibres'. From this description it would appear to resemble the bark of the *Miniatae* (described by Blake and by Gardner 1954) more closely than that of any other group. In view of the divergence from Fitzgerald's description it is an extraordinary coincidence that Gardner's account of the colour of the bark should support Maiden's wishful thought, as it appears from closer study that *E. lirata* and *E. similis* are in no way related. The close resemblance of the bark of Gardner's specimens to that of *E. miniata* is also surprising in view of the fact that both species occur together in the same locality (Gardner 1954). Despite the discrepancies in the descriptions of the bark, the identity of Gardner's specimens has been verified by comparison with the holotype, by Mr L. A. S. Johnson of the N.S.W. National Herbarium (information communicated by Mr R. D. Royce, Curator of the State Herbarium of Western Australia).

In *E. lirata* two perianth whorls are developed. The sepals are united to form an operculum which is shed when the buds are half their final size. The scar left by the abscission of the sepaline operculum is therefore prominent prior to anthesis (Pl. XXXVI, fig. 1, 2, 5). The staminophore is annular, i.e. not lobed (Pl. XXXVI, fig. 3). (In a previous paper (Carr and Carr 1962b) the term 'staminophore' was used to mean the flaps of stamen-bearing tissue in certain *Eudesmieae*. It would be advisable, however, to use the term to mean the stamen-bearing tissue in any eucalypt and to qualify it by such adjectives as 'lobed', 'annular' or 'flanged'.) In addition to the usual terminal gland, the connective of many of the anthers has a small extra gland at its base. This character is, as far as we are aware, not shown by any species of *Eucalytus* s.s., although it is not unusual in *Symphyomyrtus*. The pattern of arrangement of the ovules and ovulodes on the placenta is shown in Pl. XXXIX, fig. 1. The ovules are in 6 longitudinal rows on the broadest part of the placenta; elsewhere they are in 4 rows. The ovulodes are in 4 rows and are restricted to the upper part of the placenta. The ovules are anatropous or almost so. The only species of *Eucalytus* s.s. which shows even a superficial resemblance to *E. lirata* in the combination of this ovule-ovulode pattern with anatropy is *E. curtisii* Blakely and White (Carr and Carr 1962b). In *E. curtisii* the anatropy is maintained in the seed but in *E. lirata* the seeds are of the form described by Gauba and Pryor (1959) as hemitropous (Pl. XXXVII, fig. 4). The inflorescence in *E. lirata* is basitonic. In *Eucalytus* s.s. it is acrotonic or atonic (Carr and Carr 1962a). On these grounds *E. lirata* must be excluded from Series *Eudesmieae* as well as from *Eucalyptus* s.s. Further investigation will be needed before it can be assigned to a Series in *Symphyomyrtus*.

### *Eucalyptus baileyana* F. Muell.

#### *E. similis* Maiden

Maiden (Vol. 5, p. 136-137) included *E. baileyana* in Series *Eudesmieae* because the stamens are in 4 bundles. Blakely did not incorporate this information in his

description of the species and it seems to have escaped the notice of subsequent authors. *E. baileyana* is correctly placed in Series Eudesmieae as it has a single perianth and a lobed staminophore (Pl. XLI, fig. 2). Its inclusion in Eudesmieae is supported by the stellate hairs of the juvenile leaves. *E. similis* is also to be included in *Eucalyptus* s.s. as the perianth is single. Maiden originally associated it with *E. baileyana* on the basis of fruit characters. The chief resemblances are those of the shape of the fruit and the shape, size and insertion of the valves. However, doubts have been raised as to the correctness of its position in the Eudesmieae. Blake suggested that it might well be excluded from the Eudesmieae and placed in Series Miniatae. This suggestion has been supported (Carr and Carr 1962b) on the grounds that (a) *E. similis* has an ovule-ovulode pattern similar to that of the members of the Miniatae, (b) examination of specimens in herbaria had confirmed the general belief that it has neither sepals nor a lobed staminophore, the chief characters of the Eudesmieae. However, it has now become apparent that the range of variation in *E. similis* may not be adequately represented in herbaria. There is a specimen at Kew collected by Mrs M. S. Clemens at Springvale, Queensland (23° 35' S., 143° 55' E.), 5/4/46, and labelled '*E. similis*', which has four minute, persistent sepals alternating with the prominent lobes of the staminophore (Pl. XLI, fig. 1). Except for these anomalous features it is acceptable as *E. similis*. It is also from the centre of the restricted area in which *E. similis* is known to occur. Furthermore, the ovule-ovulode pattern is identical with that of *E. similis*. Two possibilities exist: either the material is from an undescribed species or else it is a form of *E. similis* in which the sepals are developed and the stamens are in four bundles. If it is from an undescribed species, it must be one which is very closely related indeed to *E. similis*. In either case, the Clemens specimen supports the hypothesis (Carr and Carr 1959, 1962a) that the single perianth whorl of species such as *E. similis* and, e.g. those in the Renantherae, is petaline in origin. If Blake's suggestion that *E. similis* is allied to the Miniatae is correct, then the Clemens specimen also links the Miniatae with those members of Eudesmieae which have sepals and lobed staminophores. The existence of this specimen therefore lends powerful support to the concept of *Eucalyptus* s.s. put forward in Carr and Carr (1962a).

The range of variation in *E. similis* and *E. baileyana* is clearly not fully understood. If indeed the Clemens specimen is referable to *E. similis*, as seems probable, then it represents a kind of variation in the degree of development of the sepals in a single species which is common to many other species of Eudesmieae. In most collections of *E. baileyana* the orifice of the flower and fruit is undulate and it is not unreasonable to suppose that forms of *E. baileyana* may exist in which the suppression of the sepals is incomplete.

#### ***E. gamophylla* F. Muell.**

#### ***E. cloeziana* F. Muell.**

The only major character the species included in Blakeley's Series Paniculatae (Section Macrantherae Normales) have in common is the compound inflorescence. Blake recognized that this Series is artificial by transferring *E. argillacea* W. V. Fitzg. ex Maiden to Series Buxaeales, and suggesting that *E. shirleyi* Maiden is related to *E. pruinosa* Schau. (Series Siderophloiae). The heterogeneity of Series Paniculatae is revealed by the perianth characters of the species included in it. *E. cloeziana* has a single perianth (Pl. XLI, fig. 3, 4) and *E. gamophylla* has free, persistent sepals (Carr and Carr 1959a) (Pl. XXXVIII, fig. 1, 2). These two species therefore belong in *Eucalyptus* s.s. *E. shirleyi*, *E. argillacea*, *E. intertexta* R. T.



Baker, *E. michaeliana* Blakely and *E. howittiana* F. Muell., all have a double perianth, the outer whorl of which is caducous before anthesis (Carr and Carr unpublished data). These species belong in *Symphyomyrtus*.

Because of the structure of its perianth, *E. gamophylla* must be transferred to the Series Eudesmieae. The free, persistent sepals have been neither mentioned nor illustrated by previous authors (Mueller 1878, 1879-1884; Maiden Vol. 4, p. 128; Blakely; Black 1943-1957). Mueller discussed the systematic position of *E. gamophylla* and because he saw certain resemblances between its seeds, and chaff, and those of *E. tetragona* (R. Br.) F. Muell., suggested that possibly the best place for it was with that species. However, on this basis *E. gamophylla* should be placed rather with *E. odontocarpa* F. Muell. as the seeds and chaff of the two are identical in all characters. Although the type specimen of *E. odontocarpa* (Mueller, Sturt's Creek Desert, Feb. 1846) seen at Kew still includes seeds, Mueller did not describe them.

*E. gamophylla* and *E. odontocarpa* have many characters in common, other than those of the seeds and chaff. The flowers of both have an unlobed (annular)

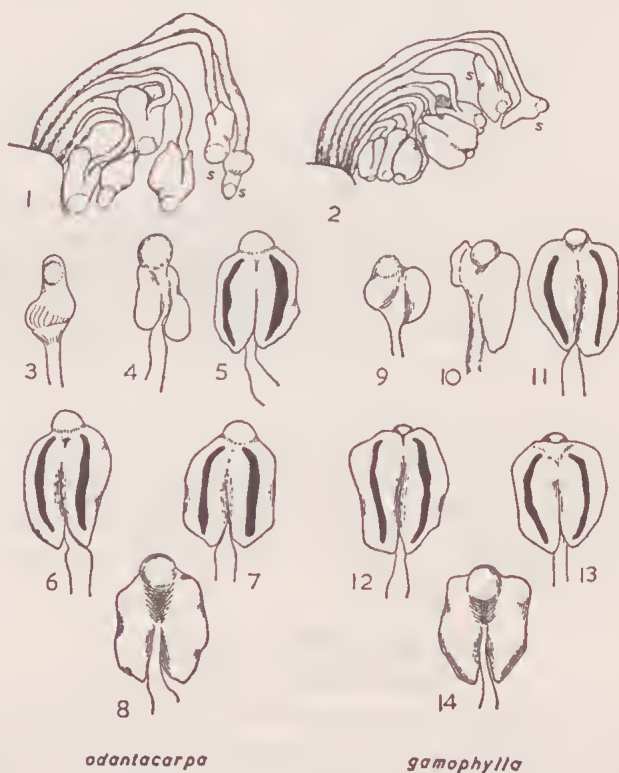


FIG. 1—Drawings 1 and 2 represent the arrangement of staminodia (s) and stamens as seen in a radial section through the staminophore (1) of *E. odontocarpa* (2) of *E. gamophylla*. Drawings 3-7 are of the adaxial surfaces of staminodia (3, 4) and stamens (5-7) of *E. odontocarpa* in the centripetal order in which they are inserted on the staminophore. Drawing 8 is of the abaxial surface of one of the stamens. Drawings 9-13 are of the staminodia (9, 10) and stamens (11-13) of *E. gamophylla* in their centripetal order and 14 shows the abaxial surface of one of the stamens.

staminophore and external staminodes (Fig. 1). In the central flower of each unit inflorescence the ovules are in 2 or 3 rows and the ovulodes in 4 rows (Pl. XXXIX, fig. 2). In the flowers of the second order of branching in the unit inflorescence the ovules are in 2 rows and the ovulodes in 3 rows (Pl. XXXIX, fig. 3, 4). In both species the inflorescence is acrotonic and the annual shoot is commonly terminated by a unit inflorescence. The unit inflorescences are 3-flowered and occur (a) in the axils of leaves or prophylls on, and terminating, short axillary shoots and (b) in the axils of leaves or prophylls on the long annual shoot. The inflorescences are frequently paired in the axils of the long shoot. Both inflorescences of a pair may be simple, as in the type, but in the uppermost axils the more adaxial inflorescence may be compound. The more abaxial inflorescence of a pair is always simple.

In their extreme forms the fruits of *E. gamophylla* and *E. odontocarpa* appear readily distinguishable. The fruits of *E. gamophylla* are 'truncate—or cylindrical-ovate, not angular, the thin edge around the orifice turned slightly inward; valves 3, less frequently 4, very short, inserted not far below the orifice, quite enclosed' (Mueller 1879-1884). To this may be added: the sepals occur as small knobs close to the opercular scar and occupy the high points of the slightly undulate orifice. In *E. odontocarpa* the fruits are of the same order of size as those of *E. gamophylla* and have usually 3 loculi. The valves are similar to those of *E. gamophylla*. Two extreme forms of fruit may be recognized (Pl. XXXVIII, fig. 3, 4, 5). In the first, the sepals are prominent and the orifice is the broadest part of the fruit. In longitudinal section the fruit is campanulate and in cross-section, almost quadrangular. In the second type the sepals are very small and the orifice of the fruit is constricted. In longitudinal section the fruit is truncate-ovate. The cross-section is circular. The two types of fruit are linked by a series of intermediate forms which show variation in the size of the sepals, the constriction of the orifice and the angularity of the fruit. In many of the intermediates the fruit shape is truncate-cylindrical. From the foregoing it will be obvious that the fruits of *E. gamophylla* fall within the range of variation of those of *E. odontocarpa*. Much of the variation in the shape of the fruits of both species appears to depend on the size of the sepals. If the sepals are large and coarse, the orifice is the broadest part of the fruit and the longitudinal ridges below the sepals tend to be prominent and persistent. If, on the other hand, the sepals are small and/or narrow, the orifice of the fruit tends to be constricted and the shape of the fruit to be truncate-ovate. If any longitudinal ridges are then apparent, they are very obscure. The observed variation in the two species is of two kinds, viz. that between collections (different trees or localities) and that between individual flowers of the same unit inflorescence. The pattern of variation within the unit inflorescence is commonly as follows: the median sepals (1) of the central flower are larger than the lateral sepals (2); in the flowers of the second order of branching the lateral sepals (3) are larger than the median sepals (4). The order of sepal size within the unit inflorescence is commonly  $(1) \geq (3) > (2) \geq (4)$ . In cases where the sepals are minute, the posterior sepals of the flowers of the second order may be either very obscure or apparently lacking in fruit.

The published descriptions referred to earlier suggest that *E. odontocarpa* and *E. gamophylla* could be distinguished from one another on the basis of the adult foliage. On examination, however, the leaf spectra of the two species show many resemblances. The cotyledons in both are of the type described as reniform and are succeeded by many pairs of leaves which are opposite, sessile and rounded at the base. These in turn are succeeded by leaves which are similar to the earlier ones except that they are perfoliate. In *E. odontocarpa* the juvenile leaves are green

when mature (S. T. Blake in litt.). The juvenile leaves of *E. gamophylla* are glaucous in most instances but seedlings with green leaves are known to occur (T. R. N. Lothian in litt.). The leaves of the next stage of growth in both species are glaucous, opposite, broadly-lanceolate and perfoliate. These leaves form the bulk of the 'adult' foliage in *E. gamophylla* and are the 'intermediate' foliage of *E. odontocarpa*. In *E. gamophylla* some of the leaves of the distal portion of the annual shoot may be simply sessile (Mueller 1879-1884) or even shortly-stalked (Black 1943-57; Cameron Herbarium 288/3). Mueller (ibid.) also records that, in some specimens the 'whitish bloom is almost entirely wanting, though neither leaves nor panicles become ever shining'. In *E. odontocarpa* distinct adult foliage succeeds the intermediate leaves. The first adult leaves are opposite, sessile or shortly-stalked, but later leaves are petiolate, linear-lanceolate and shining green when fresh. Towards the distal part of the annual shoot intranodes may develop, resulting in the separation of the members of the leaf pairs (Carr and Carr 1959a).

These comparisons show that the differences between *E. gamophylla* and *E. odontocarpa* are very small or non-existent. Difficulties have been encountered in discriminating between the two in the field. A specimen at Kew (Lazarides 6257) labelled *E. odontocarpa* (identified by N. Forde) is from a plant which, according to the collector's notes has 'connate, mostly glaucous leaves'. The fruits are a perfect match for those of most collections of *E. gamophylla* except that the sepals are unusually long. The leaves are much larger than those of any specimens of *E. gamophylla* which we have seen. The collector's notes also state that *E. gamophylla* occurs in the same area.

A final decision on the relationship between the two species can only be reached after further investigation in the field and from observation of the behaviour of plants in cultivation, but from the evidence of herbarium specimens it is obvious that *E. odontocarpa* and *E. gamophylla* must be very closely related, if not identical. They may be cline forms of a single species, or *E. gamophylla* may be a form of *E. odontocarpa* which flowers precociously or it may be a form of *E. odontocarpa* with persistently juvenile foliage. Such forms are known in other eucalypt species.

In *E. cloeziana* the perianth is single (Pl. XLI, fig. 3, 4) and the seed coat resembles in structure that of members of the Renantherae. The demonstration that the perianth is single depends on the availability of really critical material. Mature buds have only a single perianth whorl and are without an opercular scar, but experience with such species as *E. lehmanni* (Schau.) Benth. (*Symphyomyrtus lehmannii* Schau.) and *E. macrocarpa* Hook. (to be included in *Symphyomyrtus*) has shown that examination of mature flower-buds does not always give reliable evidence. Only by an examination of very young flower buds can one demonstrate conclusively that the perianth is single throughout its development. The whole outer cuticle of somewhat older (but still small) flower-buds of *E. cloeziana* shows a misleading tendency to crack into scurfy fragments which may be mistaken for the remains of an outer perianth whorl.

The seeds have a shape described by Grose and Zimmer (1958) and by Gauba and Pryor (1958) as characteristic of renantherous species (*Eucalyptus* s.s.). The micropyle and hilum are close together on the small basal facet of the seed. In addition, the vascular strands of the raphe are long and much-branched, as described by Gauba and Pryor (loc. cit.) for members of Renantherac. The seed coat is a double structure of which the outer layer is formed by the outer integument. The outermost cell layer is heavily lignified and contains very little tannin. In this feature it resembles *E. acmenioides* Schau, and *E. umbra* ssp. *carnea* (R. T. Baker) L.



Johnson (Johnson 1962), but its seeds are much paler than those of either of those species.

The inflorescence, as in the majority of members of *Eucalyptus* s.s., is acrotonic. The cotyledons are reniform and the primary leaves bear stellate hairs, a character shown by many species of *Eucalyptus* s.s. but by few species of *Symphyomyrtus*. The spectrum of characters of *E. cloeziana* is unusually wide, compared with that of other species of *Eucalyptus* s.s. Some characters are of a kind normally associated with the more advanced members of the genus. For instance, the trees are tall (120-150 ft), the flowers are small and lack sepals, the staminophore is not lobed and the time from initiation of the inflorescence buds to flowering is at least two years (see Carr and Carr 1959a). The ovules are anatropous with a long vascular bundle and resemble those of some members of Section *Renantheroideae* (Carr and Carr unpublished). In other characters, *E. cloeziana* resembles some members of Series *Eudesmieae*. The leaves are discolorous and the inflorescences compound. The anther-lobes are parallel, although the dehiscence-slits are convergent at the top (Fig. 2). The ovule-ovulode pattern (Pl. XL, fig. 2) is similar to that of *E. tenuipes* (Maiden and Blakely) Blakely & White (Carr and Carr 1962b). The ovules are confined to the lower part of the placenta and the ovulodes to the upper part. On the broadest part of the placenta the ovules and ovulodes are in 4 or 5 (occasionally 6) longitudinal rows but the ovulodes at the top of the placenta are in two rows.

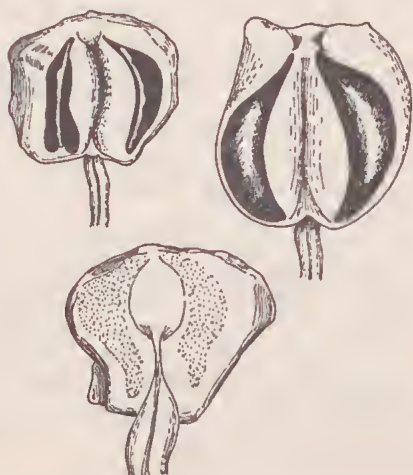


FIG. 2—Stamens of *E. cloeziana*. The upper drawings are of the adaxial surface of representative stamens. The lower drawing shows the abaxial surface of a stamen. The upper left-hand drawing is of an outer stamen, the right-hand one of an inner stamen.

*E. cloeziana* does not appear to be closely related to any other known species of *Eucalyptus* s.s. In certain characters it is close to *Renantherae*, in others to the *Eudesmieae*. The characters of the anthers fall well within the range shown by species of Series *Eudesmieae*. Although *E. cloeziana* has neither sepals nor a lobed staminophore, neither *E. similis* (as it is described in Blakely and Maiden) nor the members of Series *Miniatae* have these characters. The strictly anatropous ovules and the ovule-ovulode pattern suggest an affinity with *E. curtisii* Blakely and

White and *E. tenuipes* but in those species the seed characters differ from those of *E. cloeziana*. For the moment, all that can be said is that *E. cloeziana* links the Eudesmieae and the Renantherae. The combination of the characters of these two groups (so widely separated by Maiden and by Blakely) in *E. cloeziana* is important in corroborating the suggestions concerning relationships between species of *Eucalyptus* s.s. put forward in a previous communication (Carr and Carr 1962a).

***E. jacksonii* Maiden**

The transfer of this species from Series Transversae has already been suggested (Carr and Carr 1959a). Its true affinities were recognized by Gardner (1953) who suggested that it should be placed with *E. patens* Benth. and *E. marginata* Sm. Further investigation has shown that this proposal is supported by characters other than those of the perianth. The seed coat is double (Gaub and Pryor 1958) and the ovules and ovulodes are in two longitudinal rows (Carr and Carr 1962b).

***E. preissiana* Schau.**

***E. megacarpa* F. Muell.**

***E. mitrata* C. A. Gardner**

Of these three species which were included by Blakely in the Series Globulares, *E. preissiana* and *E. megacarpa* have already been shown to have a single perianth whorl (Carr and Carr 1959a). Their classification in *Eucalyptus* s.s. is confirmed by seed coat structure (Carr and Carr 1962a) and by the arrangement of the ovules and ovulodes (Carr and Carr 1962b) (Pl. XL, fig. 1). *E. mitrata* is a rare species which is believed to be extinct in its natural habitat (A. J. Gray in litt.) although it is cultivated in western Victoria. Blakely placed it with *E. megacarpa* in a Subseries Glandulares, but Gardner (pers. comm.) suggests that it should be included, together with *E. preissiana* and *E. megacarpa* in a separate Series which he proposes to call 'Megacarpae'. We have recognized its similarities with the other two species but have not been able to satisfy ourselves that the perianth is single throughout its development. The youngest buds available in herbaria have all been found to be cracked at the junction of the hypanthium and operculum. However, the seed coat resembles that of the other two species and the ovules and ovulodes are also arranged in two longitudinal rows (Carr and Carr 1962b). As far as we are aware, this arrangement is exclusive to *Eucalyptus* s.s. The grouping of *E. mitrata* with *E. preissiana* and *E. megacarpa* is therefore justified. For the time being, until the relationships between species within *Eucalyptus* s.s. are fully worked out, it seems best to maintain the group Megacarpae as a unit which might well precede Series Diversiformae in Section Renantheroideae.

***E. guilfoylei* Maiden (Series Ochroxylon)**

***E. microcorys* F. Muell. (Series Steatoxylon)**

***E. raveretiana* F. Muell.**

***E. deglupta* Blume**

***E. brachyandra* F. Muell.**

} (Series Myrtiformes)

Series Myrtiformes, as set out by Blakely, includes four species and one variety. We have seen no material of *E. schlechteri* Diels. nor of *E. raveretiana* var. *jerichoensis* Domin. but Blake considers that the former is conspecific with *E. deglupta*. He has shown that *E. raveretiana* var. *jerichoensis* is *E. microtheca* F. Muell. It is convenient to consider the remaining species (*E. deglupta*, *E. raver-*



*tiana* and *E. brachyandra*) together with *E. microcorys* and *E. guilfoylei* as they are all obviously wrongly placed by Blakely in his Section Renantherae.

The seeds have been examined by Gauba and Pryor (1958) who found that they differ considerably in form and structure from those of the remainder of the Renantherae. In all five species the seed coat is a single structure, whereas in the rest of the Renantherae the seed coat is a double structure. In all five species the perianth is double and the calyx is caducous. Unopened buds have a prominent scar marking the line of abscission of the calyx. This is shown for *E. raveretiana* in Pl. XXXVII, fig. 6, which also shows the remains of the calyx attached to the tip of the inner operculum. The same feature in *E. guilfoylei* has been illustrated previously (Carr and Carr 1959) and for *E. brachyandra* the illustrations in Maiden (Vol. 3 Pl. 127) and Gardner (1960) may be consulted. As in the other species, the sepaline operculum is abscised very early in the development of the flower bud in *E. microcorys* and *E. deglupta*. It is therefore clear that all five species belong in *Symphyomyrtus*.

### Acknowledgements

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### Explanation of Plates

#### PLATE XXXVII

- Fig. 1-5—*E. lirata*. (1) young flower bud with outer operculum still present and covering the bud. (2) young flower bud which has just lost the outer operculum (both x 10). (3) Fruit (x 10) to show the unlobed staminophore. (4) Seed (slightly immature); M, micropyle; H, hilum (with the chalaza to the right) (x 25). (5) Mature flower bud, showing the prominent opercular scar (x 9).  
Fig. 6—*E. raveretiana*, showing the prominent opercular scar and a fragment of the outer operculum (O) at the tip of the inner one (x 25).

#### PLATE XXXVIII

- Fig. 1—*E. gamophylla*. Young unit inflorescence showing the prominent sepals and the abscission scars of the two bracts (x 15).  
Fig. 2—Fruit of *E. gamophylla* to show the persistence of the sepals (arrow) and the undulate orifice (x 12.5).  
Fig. 3, 4 and 5—Fruits of *E. odontocarpa*, showing extremes of fruit shape. 3, 4, fruits with large sepals; 5, fruits with small sepals (x 4).

#### PLATE XXXIX

- Dissections showing the ovules and ovulodes *in situ* on the placenta of (1) *E. lirata* (x 34), (2) *E. gamophylla* (x 45), (3) *E. odontocarpa* (x 39), and (4) *E. gamophylla* (x 38). (2) is from the central flower of a unit inflorescence. (3) and (4) are from lateral flowers of unit inflorescences, and illustrate the close similarity of ovule-ovulode arrangement in the two species. The ovules are shaded in the explanatory outlines on the interleaf.

#### PLATE XL

- Fig. 1—Dissection of *E. megacarpa*, showing the ovules and ovulodes *in situ* on the placenta. The ovulodes (the smaller dark structures at the top) and ovules are in two longitudinal rows (x 35).  
Fig. 2—Dissection of *E. cloeziana*. Ovules in 6 longitudinal rows and 3-4 transverse rows. The only ovulodes shown are the two structures at the top of the placenta. Another transverse row of 2 ovulodes is hidden by the curve of the placenta (x 48).

#### PLATE XLI

- Fig. 1—Immature fruit of '*E. similis*' (collected at Springvale by Mrs Clemens—see text), showing persistent sepals (arrows) and lobed staminophore (x 8) (Kew negative 5584).  
Fig. 2—Fruit of *E. baileyana* from Mueller's type material at Kew, showing lobed staminophore (arrows) and absence of sepals (x 8) (Kew negative 5585).  
Fig. 3—*E. cloeziana*. Longitudinal section of very young flower bud to show the single operculum (x 40).  
Fig. 4—An enlargement of the same, showing that the cuticle is continuous over the junction between the operculum and the hypanthium (x 85).